**Extended Response: Muscular Skeletal System and DNA**

Score:\_\_\_\_\_\_/25

a) Protein synthesis involves two stages, transcription and translation. Describe the main steps in translation. (7 marks)

**Any 7 for 1 mark each**

• mRNA transported/moves (from the nucleu) to the cytoplasm

• mRNA binds to ribosome

• mRNA bases in groups of 3 per codon

• tRNA contains anti-codon

• tRNA recognises codon on mRNA / anticodon is complementary to mRNA codon

• tRNA brings amino acid to ribosome

• peptide bond forms between amino acids

• Function of start/stop codons

**Total 7**

b) Describe the differences between nuclear DNA and mitochondrial DNA.

(8 marks)

Any 8 for 1 mark each – must compare a difference directly to get the two marks for the difference.

|  |  |
| --- | --- |
| Nuclear DNA | Mitochondrial DNA |
| •nDNA located in nucleus  • nDNA is spiral twisted strand –  • nDNA codes for all protein synthesis/gene expression  • half of ones nDNA comes from each parent  • nDNA is bound to proteins (histones)  • nDNA has a lower mutation rate  • Inherited from both parents  • 46 molecules per cell | • mtDNA located in the mitochondria  • mtDNA is formed in small circular molecules  • mtDNA codes of transfer RNA/making some enzymes  • mtDNA is inherited from mothers only  • mtDNA not bound to proteins  • mtDNA has a higher mutation rate  • Inherited from mother only  • 5-10 molucles per mtiochondria |

**Total 8**

1. There are 6 different types of synovial joints within the human body. State what a synovial joint is and explain the types of movement the hinge, saddle and gliding joint provide. In your answer, give an example of where each of these types of joint could be found in a human body.

(8 marks)

* The site where two bones come together (1 mark) and are freely moveable (1 mark)

|  |  |  |
| --- | --- | --- |
| **Type of joint** | **Movement** | **Example** |
| Hinge | Flexion and extension / movement in one plane (1 mark) | * Elbow * Knee * Ankle (Any one,1 mark) |
| Saddle | Side to side and back and forth movement / movement in two planes (1 mark) | Thumb (1 mark) |
| Gliding | Allow movement in any direction/ in a side to side **and** back and forth motion/ movement in two planes  (1 mark) | * Between carpal bones * Between tarsal bones * Between sternum and clavicle * Between scapula and clavicle (Any one, 1 mark) |

(8 marks)

d) Use annotated diagrams to explain the sliding filament model of muscle contraction showing a sarcomere contracted and relaxed. (7 marks)

**Must have the following 2 marks**

• Thick myofilaments - myosin and thin myofilaments - actin labelled correctly labelled correctly

• Actin and myosin are the same length in both the contracted and relaxed diagram

**Any of the following 5 points for 5 marks**

• Actin and myosin slide past one another when the muscle is contracted/relaxed

• Sarcomere is shorter in contracted sarcomere (compared to relaxed sarcomere)

• H zone is larger in relaxed sarcomere (smaller in contracted sarcomere)

• I band and A band both correctly labelled

• H zone and Z line both correctly labelled

• ATP is required for muscle contraction